SCIENCE

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison-on-Hudson, N. Y.

ON THE UNTECHNICAL TERMINOLOGY OF THE SEX-RELATION IN PLANTS.

THE modern conception of the sex-relation and the alternation of generations in plants has so changed our point of view respecting the morphologies of various members that an entirely new terminology has recently come into use to express the new-found homologies. At the same time, there is an attempt to restrict or to specialize the use of such age-long words as male and female, sex and the like, when applying them to plants. This part of the new terminology which touches common language is not above criticism, and I wish briefly to advert to it.

It should be said, in the first place, that the original conceptions of sexuality in plants, from Camerarius down to the middle of this century, were borrowed and adapted very largely from analogy with the animal kingdom. The stamens were considered to be male organs of sex and the pistils to be female organs, the idea of the necessity of a conformed sex-member being evidently borrowed from a knowledge of animal morphology. At the present time, however, our conception of the sex-relation of the higher plants is borrowed from a study of the flowerless plants, which, with every reason, are believed to represent a more primitive stage of evolution than the flowering plants. The true significance of the sex-process in plants was first clearly conceived

by Hofmeister in 1849, when he propounded the hypothesis that certain great groups of plants undergo an alternation of generations, a sex-bearing generation being followed by a sexless generation. In certain plants, as the ferns, the sex-generation soon disappears and the sexless generation leads a wholly independent life; this sex-generation is the prothallus of the fern, and the sexless generation is the foliaceous fern-plant. But in certain other plants, as the mosses, the sexless generation remains attached to or incorporated with the sex-generation. Many of these flowerless plants produce a prothallus from the spore, and upon this prothallus are two minute unlike organs, one female in function because it develops the succeeding generation, and the other male in function because it produces the cells which fertilize the female cells. Recent morphological studies have shown that in the flowering plants the asexual generation is enormously developed and is 'the plant,' whilst the sex-generation is reduced to the minimum and is represented by a female organ developed within the ovule and a male organ developed in the pollen grain. The prothallus within the ovule encloses the germ of the asexual generation in its fertilized sexual cell, and this germ becomes the embryo of the seed; and the prothallus is absorbed, or else it remains as the albumen —or endosperm or perisperm—of the seed.

This very brief and imperfect outline is sufficient to bring the point which I have in mind before the reader, namely, how far can we use the terms 'male' and 'female,' and what must be the common language of the sex-relation in plants? Some morphologists now object to calling a stamen a male organ, or a pistil a female organ; and they base their reform upon the undisputed morphological fact that the male sex-phase of the plant is comprised within the short span and function of the generative cell developing from the pollen grain, and that the female phase is associated only with the development of the prothallus in the ovule. It should be pointed out, however, that the discovery of these morphological facts does not in the least shift the old-time attribute of maleness as applied to the stamen or of femaleness as applied to the pistil; for whether the pollen grain is sperm, as older naturalists supposed, or whether it is a spore and gives rise to a secondary generation which discharges the office of sperm, it is still all contained in the stamen; and the stamen is, in the broad sense of common language, a sexual member because its entire office is the discharge of the paternal relation. It is as much a member or organ of sex as the root is an organ of nutrition. The meaning of the sex-process has not been materially changed by the recent studies. 'Male' and 'female' never did and never can be made to express strict morphological homologies. An organ of an animal or a plant is male if it exercises the functions of paternity and not of maternity. The stamen is such an organ. Its entire office is that of maleness. The attempt to restrict the terms male and female to the ultimate sexual process seems to me to be unwarranted and hypercritical. It is interesting to observe that the morphologists fall into the very pit which they have digged, when they talk of male and female prothalli. Surely the prothallus is no more sexual than a stamen or a leaf. The egg cell and the male cell are the sexual organs, unless we choose to carry the purism to the physiological units; and since these organs soon disappear, as such, it follows that we cannot apply the terms 'male,' 'female,' 'sex,' and the like, to plants, save in the very brief period during which impregnation is taking place. This practically means that we must eliminate any reference to sexuality in all untechnical speech about plants, and the result would contribute to anything but clearness.

The common language of sex has always dealt in analogies. There are perfectly good and sufficient technical terms to designate the homologies and the ultimate physiological processes. If the hypercriticism of the plant morphologists were to be accepted for the animal creation, pandemonium would come of it. One could not speak of the members of generation as sex organs, nor of any animal as male or female. I insist that it is perfectly proper to speak of a staminate willow as male, because its ultimate function is paternity; if I cannot speak of it as a male plant, then I cannot call a bull a male animal.

L. H. BAILEY.

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*ON THE DIFFUSION OF METALS.**

PART I.—DIFFUSION OF MOLTEN METALS.

IN the first part of the paper the author alludes to some earlier experiments he made in 1883 on the diffusion of gold, silver and platinum in molten led. He points out that, although the action of osmotic pressure in lowering the freezing point of metals has been carefully examined, very little attention has been devoted to the measurement, or even to the consideration, of the molecular movements which enable two or more metals to form a truly homogeneous fluid mass. The absence of direct experiments on the diffusion of molten metals is probably explained by the want of a sufficiently accurate method. Ostwald had stated, moreover, with reference to the diffusion of salts, that "to make accurate experiments in diffusion is one of the most difficult problems in practical physics," and the difficulties are obviously increased when molten metals diffusing into each other take the place of salts diffusing into water.

The continuation of the research was mainly due to the interest Lord Kelvin had always taken in these experiments. The want of a ready method for the measurement of comparatively high temperatures, which led to the abandonment of the earlier work, was overcome when the author arranged his recording pyrometer, and the use of thermo-junctions in connection with this instrument rendered it possible to measure and record the temperature at which diffusion occurred. Thermo-junctions were placed in three or more positions in either a bath of fluid metal or an oven carefully kept hotter at the top than at the bottom. In the bath or oven, tubes filled with lead were placed, and in this lead, gold, or a rich alloy of gold, or of the metal under examination, was allowed to diffuse upwards against gravity. The amount of metal diffusing in a given time was ascertained by allowing the lead in the tubes to solidify; the solid metal was then cut into sections, and the amount of metal in the respective sections determined by analysis.

The movement in linear diffusion is expressed, in accordance with Fick's law, by the differential equation

$$\frac{dv}{dt} = k\frac{d^2v}{dx^2}.$$

In this equation x represents distance in the direction in which diffusion takes place; v is the degree of concentration of the diffusing metal, and t is the time; k is the diffusion constant, that is, the number which expresses the quantity of the metal in grams diffusing through unit area (1 sq. cm.) in unit time (one day) when unit difference of concentration (in grams per c. c.) is maintained between the two sides of a layer 1 cm. thick. The author's experiments have shown that metals diffuse in one another just as salts do in water, and the results were ultimately calculated by the aid of tables prepared by Stefan for the calculation of Graham's experiments on the diffusion of salts.

The necessary precautions to be observed

* Abstract of the Bakerian lecture given by Professor W. C. Roberts-Austen before the Royal Society and printed in the Proceedings of the Society.

and the corrections to be made are described at length, and the values of the diffusivity of various metals in lead are then given.

The values for k, the diffusivity, given in sq. cm. per day, are as follows:

	k	
Gold in lead	3·19	at 500°.
" " bismuth	4·52	" "
" " tin	4·65	" "
Silver in tin	4·14	" "
Lead in tin	3·18	" "
Rhodium in lead	3·04	" "
Platinum in lead	1·69	" 490°.
Gold in lead	3·03	" "
Gold in mercury	0·72	" 11°.

In order to afford a term of comparison, it may be stated that the diffusivity of chloride of sodium in water at 18° is 1.04.

The author at present refrains from drawing any conclusion as to the evidence which the results afford respecting the molecular constitution of metals. It is, however, evident that they will be of value in this connection, because, with the exception of the gases, they present the simplest possible case of diffusion which can occur—the diffusion of one element into another.

Thus the relatively slow rate of diffusion of platinum, as compared with gold, points to its having a more complex molecule than the latter.

PART II.—DIFFUSION OF SOLID METALS.

The second part of the paper is devoted to the consideration of the diffusion of solid metals. Much of the evidence is historical, for there has long been a prevalent belief that diffusion can take place in solids, and the practice in conducting important industrial operations supports this view. In this connection the author cites two truly venerable 'cementation' processes. The object in the first of these is the removal of silver from a solid gold-silver alloy; while the second is employed in steel-making by the carburisation of solid iron. In both or these processes, however, a gas may intervene, though the carburisation of iron by the diamond, which had been effected *in vacuo* by the author, suggests that if a gas does intervene in the latter case, its quantity must be very minute. In connection with the mobility of various elements in iron, the work of Colson, of Osmond and of Moissan is especially referred to.

The author points out that in 1820 Faraday and Stodart showed that platinum will alloy with steel at a temperature at which even the steel is not melted, and they express their interest in the formation of alloys by cementation, that is, by the union of solid metals.

The remarkable view expressed by Graham in 1863, that the "three conditions of matter (liquid, solid, gaseous) probably always exist in every liquid or solid substance, but that one predominates over the other," is shown to have afforded ground for the anticipation that metals would diffuse into each other at temperatures far below their melting points. Reference is then made to the important work by Spring in 1886 on the lead-tin alloys, which retained a certain amount of molecular activity after they had become solid, and special importance is attached to the proof afforded by Spring, that alloys may be formed either by the strong compression of the finely divided constituent metals at the ordinary temperature (1882) or (1894) by the union of solid masses of metal compressed together at temperatures which varied from 180° in the case of lead and tin to 400° in the case of copper and zinc; tin melting at 227° and zinc at 415°.

The evidence as to the volatilization of solid metals is then traced, and allusion is made to the expression of Robert Boyle's belief, that even such solid bodies as glass and gold might respectively 'have their little atmospheres and might in time lose their weight.'

Merget's experiment on the evaporation

of frozen mercury is quoted in relation to Gay-Lussac's well-known discovery that the vapors emitted by ice and water both at 0° C are of exactly equal tension.

Demarçay's experiments on the volatilization of metals *in vacuo* at comparatively low temperatures is connected with the evidence afforded by Spring (1894), that the interpenetration of the two metals at a temperature below the melting point of the more fusible of the two is preceded by volatilization.

The author then points out that, interesting as the results of the earlier experiments are, as affording evidence of molecular interpenetration, they do not, for the purpose of measuring diffusivity, come within the prevailing conditions in the ordinary diffusion of liquids, in which the diffusing substance is usually in the presence of a large excess of the solvent, a condition which has been fully maintained in the experiments on the diffusion of liquid metals described in the first part of the paper. Van't Hoff has made it highly probable that the osmotic pressure of substances existing in a *solid solution* is analogous to that in liquid solutions and obeys the same laws ; and it is probable that the behavior of a solid mixture, like that of a liquid mixture, would be greatly simplified if the solid solution were very dilute.

The author proceeds to describe his own experiments on the diffusion of solid metals. They are of the same nature as in the case of fluid metals, except that the gold, which is the metal chosen for examination, was placed at the bottom of a solid cylinder of lead instead of a fluid one.

In the first series of experiments, cylinders of lead, 70 mm. long, with either gold, or a rich alloy of gold and lead at their base, were maintained at a temperature of 251° (which is 75° below the melting point of lead) for thirty-one days. At the end of this period the solid lead was cut into sections, and the amount of gold which had diffused into each of them was determined in the usual way. Other experiments follow, in which the lead was maintained at 200° and at various lower temperatures down to that of the laboratory. The following are the results :

				k.
Diffusivity of gold in	fluid	lead at	550°.....	3.19
"	solid	"	251°.....	0.03
"	"	"	200°.....	0.007
"	"	"	165°.....	0.004
"	"	"	100°.....	0.00002

The experiments at the ordinary temperature are still in progress, but there is evidence that slow diffusion of gold in lead occurs at the ordinary temperature. The author points out that if clean surfaces of lead and gold are held together *in vacuo* at a temperature of only 40° for four days they will unite firmly, and can only be separated by the application of a load equal to one-third of the breaking strain of lead itself.

The author thinks it will be considered remarkable that gold placed at the bottom of a cylinder of lead, 70 mm. long (which is to all appearance solid), will have diffused to the tip in notable quantities at the end of three days. He points out that at 100° the diffusivity of gold in solid lead can be readily measured, though its diffusivity is only $\frac{1}{100000}$ of that in fluid lead at a temperature of 500°. He also states that experiments which are still in progress show that the diffusivity of solid gold in solid silver or copper at 800° is of the same order as that of gold in solid lead at 100°.

He concludes by warmly thanking Mr. A. Stansfield, B.Sc., who assisted him in all but the earlier portion of the work, and by expressing the hope that the experiments described in the paper will show that the diffusion can readily be measured in solid metals, and that they will carry one step further the work of Graham.

ON THE DETECTION OF GLACIAL STRIÆ IN REFLECTED LIGHT.

It is known that in many regions of glaciation, owing to the softness or attitude of the country, particularly in the case of schists, all traces of bed-rock striæ have seemingly been effaced by post-glacial weathering. The country about Orange, a little west of the north central part of Massachusetts, affords a good example of the case in point. The rocks are soft gneisses and hornblende schists. They strike nearly north and south and dip about vertically, or, in other words, stand on edge. Their very attitude, combined with the local variation in mineralogical composition and texture, due to the banding in the gneiss, has enabled the process of weathering to work at its maximum rate. As a result, the surface of the rock, wherever exposed, is corroded to extreme roughness, and often longitudinally pitted, so that on the rock itself about all trace of striæ has vanished. Also the approximate coincidence of direction between the striæ and the strike or banding in the gneiss renders any trace of weathered striæ which may remain not only difficult of detection, but unsatisfactory to the geologist, even when found.

There is, however, a means of determining the direction of ice-movement in this region. Happily the rocks are traversed here and there by quartz veins of moderate size. These veins being more resistant, often stand out in bold relief above the enclosing rocks now weathered down at their sides. They have retained not only their ice-polished surface, but this surface is often found to be well marked by sharply defined striæ and very fine parallel scratches, concerning whose origin the lens leaves no doubt.

These scratches sometimes occur in such delicacy as to render detection by the unaided eye difficult in ordinary light. By chance it was observed that in reflected sunlight the most delicate become readily visible, even at several yards distant. The distinctness with which the striæ are brought out is due to the marked contrast produced by difference of reflection between the unstriated part of the ice-polished surface, which strongly reflects the light, and the striæ themselves, which do not reflect, but appear as opaque or dark lines in a bright shining background.

Further observation seems to show that this means of detecting striæ can in many cases be used to advantage, especially where the surface to be examined is of considerable extent, the task of observation being materially facilitated without impairment of reliability. The striæ show best when observed in the direction of their drift trend, and with the angle of reflection large, forty-five or more degrees.

The above observations were made early in April in connection with a visit to Mount Monadnock, in New Hampshire; a covering of snow and ice preventing the taking of similar observations on the mountain at the time. It has since been learned, however, from Mr. C. L. Whittle, who has made a specialty of ice-movement over this mountain, that, as in the region of Orange, the striæ are now chiefly limited to the exposed edges of quartz veins traversing the granitic gneisses and other rocks which constitute the mountain.

F. C. Schrader.

Cambridge, Mass., May 2, 1896.

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*OCCURRENCE OF UINTAITE IN UTAH.**

The name Uintaite was given to the hard asphaltic substance to be discussed, by Prof. W. P. Blake in 1885. Subsequently it acquired the name Gilsonite, after a Mr. S. W. Gilson, of Salt Lake.

In appearance Uintaite is jet black, of

* Read by Mr. George H. Eldridge before the Geological Society of Washington, January 8, 1896, and reported with the author's approval by Dr. W. F. Morsell.

brilliant lustre, with powder and streak chocolate brown. It is brittle, with fracture conchoidal and hardness between 2 and 3; specific gravity, 1.07. The mineral is, like many others of the asphalt series, undoubtedly composed of a number of hydrocarbon compounds. Its position, from a physical standpoint, is at one end of the hydrocarbon series, petroleum, naphtha, and the gaseous substances being at the other, with the viscous malthas between.

Deposits of this hydrocarbon compound are, so far as present known, confined to the Uncompahgre Indian Reservation and its immediate vicinity in eastern Utah. The allied compound, Grahamite, occurs in West Virginia, and again in the Huasteca in the northwest part of the State of Vera Cruz, Mexico. Albertite, another near relation, has long been known in New Brunswick. It is quite possible also that many of the solid asphalts of other areas will, upon a more extended knowledge of their composition, be found to belong to one or another of these species.

The largest deposits of Uintaite are located along the Colorado-Utah line, 30 to 50 miles north of the Rio Grande Western Railway; others of workable width lie 40 to 50 miles west near the western edge of the Uncompahgre Reserve.

The deposits lie in the Uinta Basin, originally a structural basin, bordered by the Uinta Mountains and the Yampa Plateau on the north, the Wasatch Range on the west, the White River Plateau on the east, and the Roan or Book Plateau on the south. Erosion has greatly modified the surface appearance of the basin, the streams having cut cañons in some instances 3,000 feet in depth.

The geological formations of the basin proper are of Eocene Tertiary age and include the Laramie, Wasatch, Green River, Bridger, Washakie (?) and Uinta, the whole constituting a grand terrane of sandstones, shales and thin inconspicuous limestones.

The Uintaite is confined to no particular formation. It occurs as veins filling vertical cracks from $\frac{1}{4}$ inch to 18 ft. wide and from a few hundred feet to 5 or 10 miles in length. They have a general northwest-southeast trend. They cut shales, sandstones and limestones alike, and no displacement of the strata on either side of these cracks has ever been observed. The veins themselves, however, are faulted from 2 or 3 inches to 2 ft. Lateral cracks of wafer thinness are, in some instances, given off from the main vein, all filled with the asphaltic substance. The strata for a foot or two from the vein are often strongly impregnated with the Uintaite. Horses of the wall rock also occur, completely enveloped in Uintaite. The estimated contents of the veins to a depth of 1000 ft. is 20,000,000 tons.

Dr. Wm. C. Day (Journ. Franklin Institute, Sept., '95) has found Uintaite to consist of 56.46 % volatile matter, which is nearly or quite all condensable, 43.43 % fixed residue and 0.10 % ash; and that its percentage composition is

Carbon	88.30
Hydrogen	9.96
Sulphur	1.32
Ash	0.10
Oxygen and Nitrogen undetermined	0.32
	100.00

He speaks of it as comprising a number of radically different series of hydrocarbons, among which the paraffin series is one, and probably also the naphthene. No aromatic hydrocarbon appears to be present, or at most only in small quantity.

Uintaite is used in the manufacture of the cheaper black varnishes ($1.25 and down) and of japans, being especially prized on account of its elastic properties. It is in common use throughout the United States.

Within a region of 150 x 50 miles, in which the Uintaite all occurs in the eastern part, is found nearly all of the native asphalt series. The nearest neighbor is the Mineral Caoutchouc, Elaterite, or Wurtzilite, which in turn has at no great distance from it a substance with which it is said to have most intimate relations, Ozocerite, or Mineral Wax, and but a short distance from the latter is probably the highest grade asphaltic limestone in the United States. Maltha also occurs in the region; petroleum springs are also known, and the shales and limestones of the Green River formation are frequently found heavily impregnated with bitumen.

The region as a whole, therefore, offers a most advantageous opportunity for the study of the field relations of hydrocarbons.

RUINS OF QUIRIGUÁ.

The village of Quiriguá is about 20 miles to the west of Izabal, in Lat. N. 15° 15′ and W. Long. 89°. Nine miles away are the ruins situated on the left bank of the Motagua. Dense tropical forests cover the hills and valleys for miles around, and the only means of approach is through narrow mule paths till within some two miles from the ruins, when a passageway has to be cut by the 'mozos,' or Indian guides, with their machetes. The trees are of immense size, mahogany, ebony and lignum-vitæ being plentiful. Creepers and vines of all kinds hang down from these trees, making travel both dangerous and difficult in a tropical region where venomous insects and reptiles abound.

The first one sees on reaching the ruins is a small lake which the Indians have named 'Lake of the Idols.' An artificial mound built of small stones is within a stone's throw of the lake. As many of these rocks are of very fine marble, they probably came from the bed of the Montagua river, two or three miles away. At the base of this mound there are three obelisks 16 to 18 feet high. Each has a human face sculptured on its south side. The features of these faces are generally flattened about the forehead, the under lip large and hanging, the upper quite short, flat nosed and very large eyes with a staring look. The mouth is open in most cases and there appears to be a slight growth of beard. The other sides of these obelisks are covered with hieroglyphics enclosed in squares, many representing animals, trees, etc.

In a southerly direction we find the largest of the six obelisks, this one being 26 feet high, 5 feet wide and 4 feet thick. It is 12½ feet out of the perpendicular. It is quite probable that fully 6 or 8 feet of these shafts are buried in the soil. All the sculptured parts of the inclined obelisk of Quiriguá are certainly finer and more elaborate than on the others, the features are more regular; the nose, which is a foot long, is much sharper and the lips are not so full. The mouth is eight inches wide and the left side is broader than the right. The ears are square and are adorned with rings. The head is covered with a species of helmet shaped like a human face; the south side is similar to the north side already described, whilst the east and west have each a double row of squares containing hieroglyphics to the number of forty.

A few feet away lies an obelisk which was standing a very few years ago, according to the guides. The face on this one is different from the others; for instance, the ears are round instead of square and are formed of three concentric circles. This shaft is 18 feet high, 4 feet wide and 3 feet thick. The present condition of the sixth obelisk is not as good as some of the others. The face, which is 2 feet long by 1½ feet, has lost the nose, and the mouth is almost obliterated also; the ears are square and have no rings. Diagonally across the

breast of the idol lies a child which is partly reclining on one hand. The quality of this work would seem to prove that the same artist made both this and the inclined shaft. The only difference in the face on the south side is that the ears are ornamented with rings. The east and west sides have each 34 rectangles arranged in pairs and all containing hieroglyphics.

As the land hereabouts is but slightly above the general level of the river, there is no doubt that the frequent inundations have buried many other monuments.

The idols of Quiriguá have no altars like those of Copan, but within the space occupied by the afore-mentioned, there are two immense stones which very probably served as such. The first one is nearly round, some 12 feet in diameter, and is situated a few feet from the first obelisk. The upper portion is painted red and a sculptured tiger's head can be made out, having a human head under it. A line of finely sculptured glyphs covers the back. What looks like a seat occupies the center, around which there are several grooves which run toward the floor. All this would seem to indicate the use of this stone as a sacrificial altar.

The second stone, which is between the fourth and fifth obelisks and to the east of them, is long and oval, being 6 feet high and 25 feet in circumference. The whole surface is covered with figures in semi-relief, which are in a much better state of preservation than those seen on the other monuments. One of these figures represents a woman without hands or legs, but with the arms extending to the floor. The forehead is narrow. Another figure is that of a turtle whose eyes are one foot across; representations of many fruits and flowers now found in the surrounding mountains, covered the rest of this stone. This fact seems to explode the idea of many regarding a change of climate, since the Central American cities, monuments, etc., were built.

There are several sculptured stones which are completely covered with moss and tropical vegetation and deeply imbedded in the soft humus. On one of them a tiger's head could be made out and wherever the moss could be scraped away hieroglyphics appeared.

The truncated pyramid of Quiriguá is some 28 feet high. Oblong blocks of sandstone have been used in constructing it, but the whole is a mass of broken rock to-day. There are two platforms on the pyramid, the second one having a series of circular niches, usually two feet in diameter and fairly well preserved.

Although the monuments of Quiriguá are larger than those of Copan, they are inferior in sculpture and their extremely weathered and ruined condition would prove them to be much older also.

Some historians have stated that Quiriguá was a large city, destroyed by the Aztecs when at the height of their power, on the plain of Anahuac. The site is indeed picturesque. To-day it is the abode of the denizens of the forest, reptiles seeming to have taken to it with special *gusto*.

JOHN R. CHANDLER.
GUATEMALA, CENTRAL AMERICA, April, 1896.

CURRENT NOTES ON ANTHROPOLOGY.

PRIMITIVE ETHNOLOGY OF FRANCE.

BASING his researches on the measurements of nearly 700 skulls and an examination of abundant artefacts of the palæolithic and neolithic periods, M. P. Salmon has constructed a map showing the ethnology of France in the stone age. The results arrived at may be briefly stated to be that the whole of the territory was down to neolithic times occupied by a people distinctly long-skulled, though probably of two different types. These were not violently dispossessed or exterminated, but

more or less absorbed by two streams of short-skulled tribes, one from the northeast across the lower Rhine, the other apparently from Switzerland and beyond, down the Rhone. Later than these, at about the middle of the neolithic period, a long-skulled stock entered from the northeast or east, the shape of whose heads in other respects differed materially from the original inhabitants of Gaul.

It would be tempting to undertake the identification of these various peoples on the one hand with the protohistoric tribes whose names are mentioned by Cæsar and other early chroniclers, and on the other with types of the existing population. Some ethnologists have attempted this, but M. Salmon prefers to avoid such uncertain though alluring fields.

PALÆOLITHS FROM SOMALILAND.

THE 'palæolithic' implements from South Africa have long been known; but it is quite lately that specimens from East Africa, from the territory of the Somalis in the 'horn' of Africa, have been exhibited. Mr. Seton-Karr figures a number of them in the journal of the Anthropological Institute for February. In size and form they resemble the so-called palæolithic types. But we know that these types survived in neolithic ages, in many localities. We turn, therefore, to the evidence of their discovery in ancient strata. This proves not very satisfactory. They were found on or near the surface, and the only evidences adduced as to their alleged antiquity were their form and their weathering (patine). "Different ages and styles were found mixed together, some not much weathered, others extraordinarily so." This is surely far from conclusive as to their antiquity, and certainly would not satisfy an intelligent American collector.

COMPARATIVE ETHNIC ANATOMY.

THE anatomical differences between the so-called races or varieties of the human species have been examined with considerable attention but without satisfactory results. This has largely been owing to the personal bias of observers. Either, like Nott and Gliddon, they were determined polygenists, and were bound to elevate racial into specific differences; or they held the opposite views, and worked with an aim to efface apparent distinctions; or, especially of late years (*e. g.* Dr. Hervé, of Paris), they were so bent on seeing simian and pithecoid analogies that they lost sight of racial traits in atavistic reversions.

The vague resultant of such biased studies is seen in a discussion before the Anthropological Society of Washington, reported in the *American Anthropologist* for April. It was agreed that the term 'atavism' has been much abused by naturalists. Dr. Baker pointed out that food habits have a marked effect on osseous structures; he denied that the racial peculiarities of the negro are remarkably simian; many supposed racial criteria are merely the result of conditions which would produce them in any race; and he considered that anthropometry as at present taught is inadequate to define true morphological characters. These opinions are unquestionably well-founded, and they illustrate why so little is positively established in comparative racial anatomy after so much labor has been expended upon it.

D. G. BRINTON.

NOTES UPON AGRICULTURE AND HORTICULTURE.

THE AMERICAN PERSIMMON.

A STATION bulletin (No. 60, Indiana) has been issued upon the persimmon, and with several full-page plates of the tree and its fruit the subject is given a most favorable introduction. Prof. Troop shows that on account of the astringent principle in the unripe fruit, the tendency of the plant to

sucker, and the long time before the tree comes into bearing, the plant has been neglected. By new methods of cultivation trees may begin to bear 'in three to five years from the bud or graft,' and the fruit is capable of much improvement and very likely will equal the Japanese sorts which are considered choice delicacies by many.

Under methods of propagation it is stated that, like the apple and many other standard fruits, the persimmon does not come true by seed, and therefore a variety needs to be continued by the ordinary methods, namely, by budding or grafting either of the stem or root. A plate is given showing a 'top-worked' old tree, and by grafting the comparatively worthless tree was made to bear a fine variety of persimmon.

When we bear in mind the revolution in grape culture in this country due to thorough work upon our native members of the genus Vitis, any similar study of another fruit group is welcome, fraught as it is with the possibility of adding a new fruit of no doubtful merit to our lengthening list.

PLUM-LEAF SPOT.

THE camera and photo-engraving process are doing wonders for the Experiment Station bulletins. Number 98 of the New (Geneva) Station comes to us this week with five full-page process plates upon the plum-leaf spot. The results of a comparative study of the value of Bordeaux mixture and Eau celeste soap mixture are given. The Bordeaux is preferable and the first spraying should be made soon after the bloom falls. The same treatment also lessens the attack of fruit rot. The reader needs to see the plates to be impressed with the efficiency of the sprayings, for the loss is reduced from 86.5 per cent. to 17 per cent.

In similar spraying for the leaf spot of cherry no good results were obtained. But one swallow does not make a summer and one trial is not sufficient to condemn any spraying mixture.

FUNGICIDES INCREASE THE GROWTH OF PLANTS.

THE use of fungicides is being looked at from various standpoints. Professor Galloway and Mr. Woods in a recent report from the Proceedings of the American Association for the Advancement of Science show from experiments and a collection of facts that the Bordeaux mixture has a marked physiological effect upon nursery stock, etc. Dr. Cuboni, of Italy, found milk of lime an advantage to grape vines. Dr. Rumm observed that Bordeaux gave better grape foliage even when no fungi were present. Dr. Frank and F. Krüger, also in Germany, found that chlorophyll is greater in sprayed foliage and all the vital processes increased, even to a lengthening of the life of the leaf. Professor Galloway has demonstrated that Bordeaux when added to the soil only has a stimulating effect upon the growth of the plants. The paper concludes as follows: "Whether the beneficial effect of spraying is wholly due to the presence of the mixture on the leaves, as concluded by Rumm, Frank and Krüger, or whether the presence of the mixture in the soil, as shown by the work of the division, may not, in part at least, account for the beneficial effect is still an open question."

VEGETABLE CULTURE.

THE above is the title of a small work by Alexander Dean, F. R. H. S., of 136 pages, with 38 illustrations fresh from the press of Macmillan & Co. It covers the whole subject from the treatment of the soil, its preparation, etc., to allotment gardening. Under the latter the author writes: "The land hunger of the masses seems to be fairly satisfied where garden plots of from 20 to 40 rods in area are furnished, and rarely is it the case that these plots are not admirably

cultivated." This method of garden culture is stimulated by societies which furnish lectures to the masses, publications in the shape of primers, etc. This portion of Mr. Dean's work will be particularly appreciated by those who are interested in a similar work for the city poor in this country.

The work before us is interesting in its classification of the products, or rather the crops of the garden. The first group is the tap and bulbous-rooted vegetables, including beets, carrots, onions, celeriac, turnip, etc., followed by tuberous-rooted vegetables, of which the potato is the leading example. Under pod-bearing vegetables are peas and beans, and the fruit-bearing vegetables include squashes, cucumbers, tomatoes. Cabbage and spinach are under green vegetables, while of edible stemmed plants, as asparagus, rhubarb and celery and representatives, and also the mushroom.

The handbook is quite English in the varieties it recommends, and the calendar for operations does not coincide with the one for our climate and seasons.

Byron D. Halsted.

SCIENTIFIC NOTES AND NEWS.

THE METRIC SYSTEM.

Appleton's Popular Science Monthly for June reprints the letters contributed anonymously by Mr. Herbert Spencer to the London *Times*, and endorses their point of view in an editorial article. The *Monthly* cannot but be admired for its allegiance to Mr. Spencer even in his vagaries, but it must be regarded as unfortunate that a journal whose readers will expect to find it represent the consensus of opinion of men of science should advocate the prejudices of the uninformed. We are not surprised to find that part of Mr. Spencer's contribution was written fifty years ago, and that the authorities he quotes are Sir John Herschel's article of 1863 and Prof. H. A. Hazen. But it was not to be expected that Mr. Spencer would confuse the metric and a decimal system, and argue that the former should not be adopted because the calendar cannot conveniently be divided decimally. Can the week be divided into quarters, eights and thirds, which Mr. Spencer rightly regards as desirable? If our ancestors had had twelve fingers in place of ten we should now have a better system of numeration, but the ideal and distant day, when we shall all do what is most reasonable, can be brought nearer by acting reasonably in the present and adopting the admirable system so rapidly becoming universal. For as Sir John Herschel wrote in 1863, "Were the question an open one what standard a new nation, unprovided with one and unfettered by usages of any sort should select, there could be no hesitation."

THE RÖNTGEN RAYS.

Nature gives an account of early experiments on the Röntgen rays by Prof. A Battelli and Dr. A. Garbasso, of Pisa. Referring to the discovery that the time of exposure required for taking photographs with these rays can be greatly shortened by placing certain fluorescent substances behind the photographic plate, the authors point out that they described a method of doing this in the January number of *Il Nuovo Cimento*. In some cases Prof. Battelli and Dr. Garbasso obtained good photographs with an exposure of only two seconds. In their paper experiments were also described proving that Röntgen rays can be reflected (or at any rate scattered) from surfaces, but indicating an absence of refraction. Since the appearance of the above paper Prof. Battelli has communicated two further papers to the same journal. In the first the author arrives at the conclusion that Röntgen rays behave as if they emanate from the base of the vacuum tube rather than from the anode or cathode, also that they are emitted even after the discharge in the tube has ceased (as proved by the discharge of an electrified disc in the neighborhood of the tube). In the second paper Prof. Battelli deduces that the rays which emanate from the cathode in a vacuum tube possess photographic properties; that their action increases as the rarefraction increases (at least up to $\frac{1}{200}$ mm. of pressure); and that some of the rays are deflected by a magnet, while others are not. It is hence quite permissible to maintain that Röntgen rays exist in the interior of the tube.

THE STORAGE OF WATER.

IN a lecture delivered before the Royal institution and printed in *Science Progress*, Prof. E. Frankland states that storage has an excellent effect upon the chemical and especially upon the bacterial quality of water. Thus the storage of Thames water by the Chelsea Company for only thirteen days reduces the number of microbes to one-fifth the original amount, and the storage of the river Lea water for fifteen days, by the East London Company, reduces the number on the average from 9,240 to 1,860 per cubic centimetre or to one-fifth; and lastly, the water of the New River Cut, containing on the average 4,270 microbes per cubic centimetre contains, after storage for less than five days, only 1,810, the reduction here being not so great, partly on account of the shorter storage, but chiefly because the New River Cut above the point at which the samples were taken is itself a storage reservoir containing many days' supply after filtration. Indeed, quietness in a subsidence reservoir is, very curiously, far more fatal to bacterial life than the most violent agitation in contact with atmospheric air; for the microbes which are sent into the river above the falls of Niagara, by the City of Buffalo, seem to take little or no harm from that tremendous leap and turmoil of waters, whilst they subsequently, very soon, almost entirely disappear in Lake Ontario.

Prof. Franklin holds that if the water of the Thames basin were properly collected and stored it would furnish London with an ample supply of excellent water for fifty years to come.

CRATER LAKE.

THE U. S. Geological Survey has issued a special map showing Crater Lake, Oregon. In the accompanying description Mr. J. S. Diller states that the lake is approximately circular and averages a little over 5 miles in diameter. It is reputed to be the deepest fresh water in America, having the remarkable depth of 2,000 feet. The steep slopes of the escarpment rise from 500 to 2,200 feet above the water, forming a remarkable pit. The average diameter at the top of the pit is 5.7 miles, and its depth is 4,000 feet. Nearly one third of its bottom is over one hundred feet below the level of Klamath marsh, at the eastern foot of the Cascade Range.

"The problem at once arises, How was this vast mountain, nearly six miles in diameter and possibly 5,000 feet or more in height above the present rim of the lake, removed, and the stupendous pit now occupied by Crater Lake produced? Did it go up or down? If it was blown out by an explosion we should find an enormous rim of fragmental material commensurate with the basin; but if it sank by escape of its molten interior through a lower outlet the rim would be small and composed of imbricated and overlapping sheets of lava and fragmental material. In fact, the rim is small and composed in large measure of solid lava sheets. It is evidently the peripheral part of the original mountain's base, and not due to accumulation at the time the basin originated. Maj. C. E. Dutton, who made a special survey of Crater Lake, compares it to Kilauea, of Hawaii, whose origin he attributes to subsidence of the material in a molten state owing to its escape at some lower level. The pumice upon the surface for many miles around Crater Lake was probably blown out at Crater Lake before the pit developed, and the volcano of Wizard Island was active at a much later stage upon the bottom of the pit. It was the scene of the last eruption about the lake, and, although recent in appearance, must have occurred centuries ago."

GENERAL.

THE New York Academy of Sciences has appointed a committee consisting of Prof. William Stratford, Mr. C. F. Cox, Prof. E. B. Wilson and Prof. G. S. Huntington, to solicit subscriptions on behalf of the Huxley Memorial Fund. As has been already stated in this JOURNAL, the fund will be used to erect in South Kensington Museum a memorial statue similar to those of Darwin and Owen, and secondly, if a sufficient amount of money be raised, to establish scholarships or a fund for original research. Contributions should be sent to Mr. Cox, Grand Central Station, New York.

DURING the Buffalo meeting of the A. A. A. S., Section H, anthropology will observe, as far as practicable, the following order of program;

Monday, address of the Vice-President, Miss Alice C. Fletcher; Tuesday, archæology; Wednesday, ethnology; Thursday, somatology and psychology; Friday, general anthropology.

An International Congress of Hydrology, Climatology and Geology, will be held at Clermont-Ferrand, France, from September 28th to October 6th. The Minister of the Interior of the Republic has accepted the honorary presidency, and the government of the United States has been invited to appoint delegates.

Dr. J. Walter Fewkes will again conduct explorations for the Smithsonian Institution among the Pueblos of Arizona. He left Washington for a three months' expedition, on Saturday, May 30th, accompanied by Dr. Walter Hough, of the National Museum.

The section of agriculture of the Paris Academy has nominated the following candidates, one of whom will be selected to fill the vacancy caused by the death of M. Reiset. In the *first class*, Mr. Müntz; *second*, M. Risler; *third*, MM. Laboulbéne, Maquenne and Th. Schloesing, fils.

The first number of *Kantstudien*, a new 'Archiv.', edited by Prof. Hans Vaihinger of Halle, and published by Leopold Voss, Hamburg and Leipzig, was issued on April 25th. A special magazine devoted to Kent bears witness to the vitality of the critical philosophy in Germany, but will perhaps lead men of science to reflect that it is fortunate that they do not need to go back one hundred years and begin over again, as required by the philosophical program. The first number of the *Kantstudien* extends to 160 pages, and contains, in addition to an introduction by the editor, articles by Profs. Adickes, Vorländer, Stadler and Pinloche (the last in French), reviews and 'Kantiana.'

Prof. Röntgen has been made a corresponding member of the Berlin Academy of Science.

We learn from the *Naturwissenschaftliche Rundschau* that the mathematician, Prof. Ernest Padova died at Pisa on March 9th, and that Prof. Liebscher, director of the Agricultural Institute of Göttingen, died on May 9th.

The New York *Medical Record* states that Prof. Ehrlich has been appointed director of the new State institute in Berlin for the testing of therapeutic serum and of the laboratory attached thereto.

The Senate Committee has unanimously reported in favor of the bill restricting vivisection in the District of Columbia. The bill provides, first, for the use of anæsthetics in all painful experiments on living vertebrate animals, inoculation experiments, tests of drugs and medicines and cases of recovery from surgical procedure being exempted from this requirement; second, for the licensing of all experimenters by the District Commissioners, except those who are duly authorized officers of the government of the United States or of that of the District of Columbia; third, for the prohibition of vivisection in the public schools and in exhibitions for the general public; fourth, for the inspection of all places of experiment by inspectors to be appointed by the President of the United States. It has not been shown that any case of cruelty to animals by men of science has ever occurred in the District of Columbia, and the proposed legislation seems entirely useless.

We learn from *Nature* that the Swedish Tourists' Club has organized an expedition to the Great Lake Falls next August. The object of the expedition is to give those who join it an opportunity of seeing the total eclipse of the sun on August 9th, on becoming acquainted with Lapland, and at the same time to see two of the waterfalls in Europe—the Great Lake Falls (Stora Sjöfallet) and Harsprånget. The party will start from Gellivare on August 3d. Further information with reference to the journey can be obtained at the Tourists' Club, No. 28 Fredsgaten, Stockholm.

According to the New York *Medical Record* the Wistar Institute of the University of Pennsylvania will receive, through the generosity of Gen. Isaac J. Wistar, a number of new buildings. The Institute was founded in 1892 for the preservation of the Wistar and Horner collections and for the promotion of study and advanced research in anatomy and biology. The most important of the new buildings will adjoin the present one, and will be used chiefly for the accommodation of the large number of specimens that have been contributed to the

Wistar and Horner collections during the past three or four years. A second building is designed to furnish heat and light to the Institute. When the Institute was established General Wistar endowed it sufficiently to provide for beginning the advanced and original work for which it was intended. Every facility will now be provided for the work of original investigators under the supervision of a competent director and skilled assistants. The grading of the ground previous to the erection of the new buildings has already been begun, and it is expected that the work will be completed by the beginning of the fall term.

THE managers of the Department of Natural Science Instruction in the National Educational Association are putting forth strenous efforts to make the first meeting of the new department a most successful one. Many scientific men have already signified their intention to be present to take part in the meetings. The scientific men of Buffalo have taken hold of the matter, also, and are now proposing to organize a New York State Association of Natural Science Teachers. The movement for better science teaching thus promises to spread rapidly, and it appears that there will now be afforded such an opportunity for the effective urging of better methods and better aims as has never before occurred. This movement should be of especial interest to college and university men, since it will deal largely at first with secondary instruction, or, in other words, with *preparation* for college, and it is hoped that many college men will be in attendance. The local Science Committee in Buffalo has designated the Genesee Hotel as headquarters. This is now the Y. M. C. A. Building, where so many of the meetings will be held. The officers of the department will be in attendance at headquarters early in the week to confer with teachers and all interested in science as a factor in education.

THE United States Civil Service Commission will hold an examination on June 9th to fill two vacancies in the position of Assitant Geologist in the United States Geological Survey. The competitors must possess certain linguistic accomplishments, but the examination will relate in the main to general geology and petrography, and one of the two appointed will be required to have a special training in economic geology. All competitors must show that they have had practical experience in the field under an expert geologist. The examination will be held in Washington and in other large cities where there are applicants. The number of competitors will be large. Persons desiring to compete should write to the United States Civil Service Commission, Washington, D. C. This is the first Civil Service Examination for the geologic force since the Survey was placed in the classified service, which covers all the scientific and technical places. Vacancies in other branches of the work have long been filled in this way.

IT has been reported to the State Department by the United States Consul at Aden that Prof. Daniel C. Elliot, of the Field Columbian Museum of Chicago, with Mr. C. H. Akeley and Mr. Dodson, who accompanied Dr. Donaldson Smith on his recent expedition to Lake Rudolph, in Central Africa, arrived at Aden, at the mouth of the Red Sea, on April 14th, and after a stay at that point of a week, securing men, camels and stores, proceeded on their scientific exploration into Central Africa, the main purpose of which is to collect specimens of the animals which are rapidly disappearing.

THE death is announced of Dr. Carleton Pennington Frost, Dean of Dartmouth Medical College and professor of medicine, who died on May 24th at the age of sixty-six; also of Mr. Thomas Maine, a mechanical engineer and the author of a work on the history of the steam engine.

THE Philadelphia *Bulletin* announces that work will probably soon begin on the Museum of Art and Science of the University of Pennsylvania, for which the city has turned over to the institution twelve acres of ground adjoining the site of the Philadelphia Museum. Plans have been completed for the building, which will be an imposing structure, costing upwards of $1,000,000. A portion of the appropriation from the State in 1895 was for the purpose of erecting the museum building. This appropriation, together with the private subscriptions,

has raised the building fund to over $300,000, and it is probable that work will be begun on one wing of the structure this summer.

At the recent *Conversazione* of the Royal Society, according to the report in the London *Times*, Prof. Roberts-Austen showed several curious experiments, which are modifications of one recently described by Margot, of Geneva. A fine wire of aluminium is heated to no less than 400 degrees above its melting point, but the wire, nevertheless, remains intact. This is owing to the formation of a fine film of alumina on the surface of the wire, and the metal, being very light, does not run into globules, as it might be expected to do. The molten wire has, moreover, a current passing through it and will, if approached by a similar wire or by a magnet, enable all the effects of mobile conductors carrying currents to be illustrated. One experiment showed that the molten wire can even be twisted on itself without rupture, and the effects of a tenacious thread of molten metal moving in response to electrical influences are very singular.

M. Méline, who is Minister of Agriculture as well as Premier of France, has directed the professors of agriculture to suspend their lectures and to go through the rural districts in order to advise farmers to meet the failure of the hay crop by sowing vetches, maize and other fodder, as also by utilizing oilcake, straw, bran and corn.

At a recent meeting of the British Astronomical Association, Dr. Gill, astronomer in charge of the Royal Observatory at the Cape of Good Hope, according to the report in the London *Times*, gave an account of the work in which he had been engaged. He mentioned first the completion of his investigation on the solar parallax and the mass of the moon, derived from observation of minor planets on a programme which he had prepared and which had been carried out at Newhaven, Leipsig, Göttingen and Bamberg, as well as at the Cape. The details of these results would be presented to the Congress of Directors of Nautical Ephemerides, which would assemble in Paris in May, and he would urge at that meeting the adoption of these constants for general use by astronomers. Dr. Gill also stated that the work of the geodetic survey of South Africa, which he had directed since 1885, was completed and printed, and that the report would be presented to the Cape Parliament in May. The first volume of the Cape *Durchmusterung* had been passed through the press. The whole of the latter work would consist of three volumes containing the places and magnitudes of 450,000 stars between latitude 18 deg. south and South Pole; it would be complete as far as magnitude 9.3 or 9.4, and would contain most of the stars as far as the 10th magnitude. A fundamental star catalogue for the equinox, 1890, containing the results of the Cape transit circle observations during the past ten years, was far advanced towards completion. Dr. Gill also mentioned that Mr. M'Clean's splendid gift of a powerful equatorial would now divert his efforts more to the field of astrophysics.

The Washington *Star* states that a large invoice of plants for the department of botany has just been received at the Catholic University from Rev. Father Langlois, of Louisiana. This is the third donation of the kind Father Langlois has made to the University this year. Dr. Greene will leave for California shortly to collect specimens for his herbarium.

UNIVERSITY AND EDUCATIONAL NEWS.

The United States Senate has passed the bill to charter the National University.

The trustees of the College of New Jersey at Princeton, commonly called Princeton College, have filed in the County Clerk's office a certificate changing the name of the institution to Princeton University.

At a meeting of about fifty friends of the Johns Hopkins University in Baltimore, on May 26th, the sum of $138,750 was subscribed toward meeting the deficit caused by the failure of the Baltimore & Ohio Railroad to pay dividends on its stock. It is hoped that $50,000 a year for five years may be subscribed.

Mt. Holyoke College has received $7,000 by the will of Miss Hitchcock, of Springfield.

The twenty-fifth anniversary of President Angell's administration will be celebrated at the

University of Michigan on June 24th. Addresses will be made by Dr. W. T. Harris, U. S. Commissioner of Education, and Prof. J. O. Murray, of Princeton University.

THE University of Nebraska holds a summer school at Lincoln, from June 8th to July 3d, intended especially for teachers, principals and superintendents of the State. The courses of special interest to students of science are those offered in botany by Prof. Bessey and in physics by Prof. Brace. It is the intention of the University to offer next year courses in those subjects omitted this year. Thus, in 1897 zoölogy and chemistry will probably be offered in the place of botany and physics.

THE Board of Overseers of Harvard University have elected Theobald Smith, M. D., professor of comparative pathology; Charles Hubert Moore, A. M., professor of arts and director of the Fogg Art Museum; Lewis Jerome Johnson, A. B., C. E., assistant professor of civil engineering, and Comfort Avery Adams, Jr., S. B., assistant professor of electrical engineering.

OF the ten fellows nominated by the faculty of the University of Wisconsin only one is in the pure sciences—C. H. Bunting in biology.

PROF. W. WHITMAN BAILEY, of Brown University, has been appointed by President Cleveland, a member of the Board of Visitors to the United States Military Academy at West Point, where, it will be remembered, his father was many years professor, and where he himself was born February 22, 1843.

DISCUSSION AND CORRESPONDENCE.

'PROGRESS IN AMERICAN ORNITHOLOGY, 1886-95.'

TO THE EDITOR OF SCIENCE: In the *American Naturalist* for May, of the present year, there appeared a contribution of mine entitled 'Progress in American Ornithology, 1886-95,' and in a recent issue of SCIENCE (No. 73, pp. 777-779) Dr. J. A. Allen has undertaken to reply to such parts of that article as he considers to be of a critical nature as applying to the Committee of the American Ornithologist's Union, which prepared the last edition of the 'Check List of North American Birds.' In the present rejoinder I beg to assure my distinguished reviewer, at the outstart, that my article in the *American Naturalist* was not prompted through a spirit of 'animus,' as he seems to think, and that my 'reference to the starling clearly reveals that animus' is, surely, too ridiculous to be entertained even for a moment. Dr. Allen charges me with having overlooked 'the main purpose of the new Check List, which was the revision of the matter relating to the geographical distribution of the species and subspecies.' This omission was entirely intentional upon my part, and I preferred to leave it to other and more competent reviewers who have kept pace with that division of the subject during the last ten years, and who are for that reason far better prepared to deal with it than I am, who have not made any special attempt in that direction. That I did not refer to the matter of geographical distribution is any evidence that I underated its value is, to say the least, a curious inference. Upon similar grounds I might have been charged with underating the value of certain technicalities in scientific nomenclature, and of the necessity of typographical precision in the new 'Check List,' for I had nothing to say about them, and intentionally so. Other reviewers will doubtless turn their attention to such matters, and for the enlightenment of the A. O. U. Committee, and the consequent progress of American ornithology, point out the shortcomings in these premises likewise. Indeed, in *The Nidologist* for April of this year, a very good step has been taken in this direction. Through the assistance of the review to which I refer, I am prepared to say that I feel I have quite as much right to allow *Burrica* to appear in my article as *Barrica*, to which Dr. Allen has invited my attention, as he and the A. O. U. Committee have to spell 'probably' 'propably,' or Greenland with three e's, as they have in the new Check List (pp. 221 and 321).

Dr. Allen has at last given to avian taxonomers a reason, *the* reason perhaps, why the A. O. U. Committee adhere so persistently to the superantiquated classification of birds to be found in the last Check List. It is because 'the species are numbered in an orderly sequence' and 'of the still very unsettled state of the sub-

ject of the relationships of various groups of birds.' If it is to be inferred from this that the Committee propose to adopt and print the classification of American birds in the various issues of the future Check Lists, that has just appeared in the last edition of that work, until such time as the relationship of the various groups of birds is *settled*, then I would most emphatically suggest that the idea of presenting a classification at all be at once abandoned and, for the 'convenience of correspondence between collectors,' simply print a 'list' of American birds, duly numbered in orderly sequence.

We might even carry the matter still further, and, as the scientific names of the birds are an abomination to the vast majority of 'collectors,' a 'list' of the vernacular names alone might be given, and these made alphabetical and duly 'numbered in orderly sequence.' What a simple science ornithology would become, and how convenient for the collector!

Now that Dr. Allen has had so much to say in his review about my 'presumptuous criticism,' and has totally ignored all the main points of my article in *The American Naturalist*, I should like to propose to him and to the A. O. U. Committee a few questions in reference to what we find in the new check list. I very much doubt their ability to answer them.

1. Upon what grounds are the Great Auk (*Plautus impennis*) and the Labrador Duck (*Camptolaimus labradorius*), both now admitted by the Committee to be *extinct*, retained in a list of *existing* North American birds?

2. Upon what grounds is *Crecoides osbornii* omitted from the List of Fossil Birds? (See Proc. Amer. Phil. Soc., v. xxx., p. 125.)

3. What consistency is there in admitting *Piranga rubiceps* to the list, and excluding (for one example among many) *Gubernatrix cristatellus?* [As the normal habitat of *P. rubiceps* is certain *high* altitudes of a few localities in Colombia and Ecuador (the species not even occurring upon the Isthmus of Panama, it would seem that Dr. Allen's comments on *Gubernatrix cristatellus* might, with equal consistency, be applied to it. Of the latter species he has said, "Its habitat being Brazil, it seems beyond probability that it could have reached the locality of its capture without human aid." (Bull. N. O. C., Vol. V., p. 240.)].

4. Upon what grounds are the Grebes (*Podicipidæ*) made to occupy a sub-order by themselves, and the Loons (*Urinatoridæ*) and Auks (*Alcidæ*) another and separate sub-order?

5. What have the Goat-suckers (*Caprimulgi*) and the Humming-birds (*Trochili*) in common, that they should be placed in the same order?

When Dr. Allen answers these questions satisfactorily to the many inquiring ornithologists the world over, and can *prove* consistency in their premises, then I shall believe my article in *The American Naturalist* to have been 'presumptuous,' but not before.

R. W. Shufeldt.

The foregoing rejoinder by Dr. Shufeldt to my review of his paper on the A. O. U. Check-List of North American Birds requires no comment from me as regards his article in general, as I do not recognize that he has scored any points worthy of notice; the series of four questions he asks at its close may be considered as demanding some attention. In regard to the article referred to by Dr. Shufeldt in *The Nidologist*, the leading points made by the writer thereof are not well taken, as will doubtless be shown in a future number of that journal. To place emphasis on the presence of two typographical errors—the extent apparently of their discoveries in this direction—as both writers have done, is rather a compliment than otherwise to the Committee.

1. The Great Auk and the Labrador Duck. Dr. Shufeldt raised the same issue in his original paper, but it did not seem necessary to take up the space of Science to discuss it. Both species are practically members of the present fauna, as distinguished from 'fossil birds,' commonly so called, the former living till about the middle of the present century (specimens were taken as late at least as 1844), and the latter till at least 1875, or till within twenty years, and not a few ornithologists believe that some may still exist. Both species are still retained in all recent manuals and general works on North American birds as properly 'North American Birds' in the sense of the Check List.

2. *Crecoides osbornii* Shufeldt. This was omitted simply because it was accidentally overlooked.

3. *Piranga 'rubiceps' = rubriceps.* If Dr. Shufeldt makes no protest against *Icterus icterus* and *Spinus notatus*, admitted to the list on Audubon's authority, he should not object to the case of *Piranga rubriceps*, the geographical conditions being similar. So far as known, *P. rubriceps* is not kept as a cage bird; certainly it is not one of the commoner cage birds of our bird stores, as is *Gubernatrix cristatellus*. Many of the common cage birds escape from confinement and are afterwards captured, perhaps after a considerable interval of freedom, and showing very few, if any, traces of previous confinement. Among them are finches, parrots, and parrakeets from Africa, India, Australia and tropical America. Their capture may be recorded as a matter of interest, but no one considers it admissible to include such species in the list of North American birds. On the other hand, wild birds either wander or are carried by storms hundreds and even thousands of miles beyond their usual range, and are captured under circumstances which preclude the supposition of their being escaped cage birds, as in the case of many European stragglers that have occurred once, or a few times in North America. To this class of waifs belongs *Piranga rubriceps.*

4 and 5. Regarding the relationships of the Grebes, Loons, Auks, etc., probably if the A. O. U. Committee were to revise its classification they would make some changes in respect to the position of these groups; but, for reasons given in my former letter (SCIENCE, N. S., No. 73, May 22, 1896), the Committee did not consider it advisable to transpose any of the higher groups. But the Committee doubtless would not follow Dr. Shufeldt in removing the Owls from the Acciptires to place them with or near the Goatsuckers. J. A. ALLEN.

'THE POLAR HARES OF EASTERN NORTH AMERICA.'—AN ANSWER TO DR. C. H. MERRIAM'S CRITICISMS.

TO THE EDITOR OF SCIENCE: Dr. C. Hart Merriam has seen fit to devote nearly two pages of SCIENCE* to my preliminary paper on the 'Polar Hares of Eastern North America.'

It is difficult to ascertain the motive which prompted this review of my preliminary work on the Polar Hares, the mature results of which I expressly stated in the *American Naturalist*,† would soon be published in the form of a compendious revision of the New World representatives of the *Lepus timidus* group. The importance which Dr. Merriam seems to attach to the paper in question, by devoting thereto three times the space taken by his succeeding review of Sclater and Thomas' new 'Book of Antelopes,' together with the suprising attitude taken on certain questions of nomenclature and diagnostic technique, demand a rejoinder.

Waiving the objections made to my reëstablishment of the specific distinction of the American from the European Polar Hare, and my restriction of the type locality of the latter to southern Sweden, let us consider Dr. Merriam's position regarding my adoption of the name *arcticus* of Ross for the Baffin Land Hare instead of *glacialis* of Leach, which comes nineteen pages later in the same book. In the absence of any statement to the contrary, I proceed on the supposition that Dr. Merriam still agrees with me in taking the Code of Nomenclature of the American Ornithologists' Union for authority in a case of this kind.

His main objections to the use of the name *Lepus arcticus* 'Leach,' Ross, are:

(1) "Capt. Ross was not a naturalist and made no claim to technical knowledge of zoölogy."

(2) "All that he [Ross] knew of the animal came from Leach."

(3) "Ten persons have used the name *arcticus*, while thirty-six have used the name *glacialis*."

(4) "Irrespective of the merits of the two names, *glacialis* would have to be taken if we accept the rule that in cases of names of equal pertinency, the first reviser of the group has the privilege of fixing the name."

The first objection only begs the question. The rules of nomenclature no longer attempt to define what should constitute the standard of authorship, contenting themselves in such a

*Friday, April 10, 1896, pp. 564, 565.

†March, 1896, p. 256.

case as this to the definition of what constitutes a valid naming and description of genera or species. Would Dr. Merriam have us estimate the personal equation in the authorship of names proposed by such a man as Rafinesque because he fell so far below the scientific standards of a Leidy? Livingstone was 'only a missionary' and Krider a 'gunmaker,' but science is willing to say " 'A man's a man' and priority is priority 'for a' that.' "

The second objection made by Dr. Merriam is not only as irrelevant as the first, but is based on an incorrect statement. Ross knew more about the specimen than Leach did, and the latter was more indebted to Ross for points as to the animal than Ross was to Leach. They described the same specimen, and, besides giving all the diagnostic characters described by Leach, Ross adds two important ones and gives the collector, locality and date of capture of the specimen, which Leach omitted entirely. In short, Ross' description is the better of the two.

As to objection number three, the inconsistency of the numerical argument thus advanced by a member of the A. O. U. Committee on Classification and Nomenclature* favoring the old standard of 'time-honored' custom, and consensus of opinion in a question of 'equal pertinency' in specific names, strikes me as no less lamentable than subversive of the best interests of that department of American science which aims at canonical permanency in the rules of nomenclature.

The fourth objection is based on a private interpolation into the canonical code even more obviously heterodox than objection number three. I would ask Dr. Merriam where he finds the 'rule that in cases of equal pertinency the first reviser of the group has the privilege of fixing the name?' I do find in the A. O. U. Code of Nomenclature, on which Dr. Merriam has frequently had occasion to publicly pledge his faith, under Canon XVII., relating to 'Preference between competitive specific names published simultaneously in the same work * * *,' a section 3 which reads, 'Of names of undoubtedly equal pertinency and founded upon the same condition of sex, age or season, that is to be preferred which stands first in the book.' To my mind this completely covers the matter at issue and justifies my course in adopting *Lepus arcticus* as the proper name of the Baffin Land Hare.*

Regarding his criticism of my use of the Scandinavian *L. timidus* as the basis of comparison in a paper on American Polar Hares, I need make no apology. Dr. J. A. Allen's monograph of the American Hares was taken as the last authoritative declaration of an American mammalogist on the relations of these animals, and, as he failed to recognize the distinctions which I found to exist, it was reasonable that they should be demonstrated by the plan of comparison adopted in my paper.

Instead of outlining the scope and aim of my paper and stating that I had endeavored to show the close affinity, but specific distinction of the Baffin Land and Scandinavian Hares, and their great differences from the Hare of Greenland, which previous authors have more or less confounded with *L. arcticus* of Ross, my critic chiefly devotes himself to a justification of his own peculiar views on the subject of names, methods and forms of expression.

Dr. Merriam ventures no opinion as to the status of what he spells '*L. greenlandicus*' in his critique, and from his own admissions he evidently knows less about the animal than many of the authors whom he cites to support his 'time honored' but mistaken opinions.

To cap the climax of unjust sarcasm, the chief apostle of generic, specific and subspecific subdivision in this country draws a parallel between my naming of the Labrador and Newfoundland subspecies, *L. a. bangsii*, to the separation of 'weasels that turn white in winter from specimens of the same species that remain brown the year around!' Shall I answer such logic? Not until I have more time and SCIENCE more space for unscientific contro-

* Dr. Merriam was recently appointed on this Committee in place of Mr. Henshaw. See Check List N. A. Birds, 2d ed., 1895, p. vi., foot-note 1.

* Since these remarks were written, I find that Dr. J. A. Allen fully endorses the position I have taken, in his answer to an inquiry made by Mr. Witmer Stone, on this and kindred subjects, treated in the 'Correspondence' of the April issue of the *Auk* for 1896.

versy. Then, perhaps, Dr. Merriam will tell us whether he continues to recognize *Lepus americanus* and its subspecies *L. a. virginianus*.

SAMUEL N. RHOADS.

ACADEMY OF NATURAL SCIENCES,
PHILADELPHIA, April 17, 1896.

AMERICAN POLAR HARES: A REPLY TO MR. RHOADS.

THE above wail from Mr. Rhoads respecting my review of his paper on the Polar Hares calls for a brief reply. It was not the importance of Mr. Rhoads' paper, as he seems to suppose, but the importance of certain principles involved in his methods of treatment, that led to the length of my review. My criticisms were aimed mainly at two matters: one, a matter of description; the other a matter of nomenclature. In describing the new American hares, Mr. Rhoads contrasted them with a European species (*Lepus timidus*) instead of with their American relative (*Lepus glacialis*). This struck me as bad systematic zoölogy. In treating the Polar hare of Baffinland he adopted the specific name *arcticus* instead of *glacialis*, though both names appeared simultaneously in the same book. This struck me as bad nomenclature.

The reasons for retaining *glacialis* as the proper name of the animal were stated at length in my review and need not be repeated here. But in his reply Mr. Rhoads implies that I have subordinated priority to the scientific standing of an author. This I deny. Priority of publication is the cardinal principle of nomenclature—the foundation of all modern codes; without it, stability in nomenclature is impossible. But priority of *publication* and priority of *pagination* are two widely different things, and I deny that priority of pagination constitutes priority of publication. It can hardly be gainsaid that the different pages of a book appear simultaneously; hence names on different pages of the same book should be treated in the same way as names appearing simultaneously in different books. Sequence of pagination is a trivial circumstance, not to be considered in fixing specific names except in cases where no other reason for a choice can be found. Even the A. O. U. Code quoted by Mr. Rhoads concedes this, and goes so far as to accord greater weight to *sex*, *age* and *season* of the type specimen than to priority of pagination. In other words, in choosing between names of even date, sequence of pagination is a last resort.

It is useless to enter into a controversy with Mr. Rhoads over his astonishing statement that of the descriptions of the American Polar hare given by Ross and Leach, "Ross' description is the better of the two." Reference to the work in which both appeared will settle this point.

In reply to Mr. Rhoads' inquiry as to the source of the rule that 'in cases of equal pertinency the first reviser of the group has the privilege of fixing the name,' it may be stated that said rule expresses the practice of most systematic zoölogists—and I think botanists as well—and is in complete accord with the spirit of the A. O. U. Code, though not there formulated as a distinct canon. In closing, I must thank Mr. Rhoads for calling my attention to what he considers would have been a proper review of his paper. C. H. M.

THE SUBJECT OF CONSCIOUSNESS.

TO THE EDITOR OF SCIENCE: In the number of SCIENCE for May 15th there is a letter from Johannes Rehmke on the subject of 'consciousness,' about which I beg leave to be indulged in a brief statement.

Take two equal weights with handles, one weight being several times the bulk of the other. Ask a blindfolded man to tell which is the heavier, being careful not to let him touch either weight, but only the handle, and he will not judge of a difference. Now let the same man, seeing the weights, but not knowing them to be the same, decide which is the heavier; he will affirm that the smaller is the heavier weight. This is a common experiment in psycho-physics. There are on record a vast number of similar experiments which have been abundantly verified, all leading to the conclusion that there are two elements in sensation, the one of consciousness of the effect upon self and the other an inference relating to the thing observed by any one of the senses. All of these experiments, and a vast body of experiences which every individual undergoes,

testify to these two elements. At the last meeting of the National Academy I presented a paper on this subject, from which I extract the opening paragraphs, as follows:

All operations of the mind are judgments. On examining the nature of the judgments we discover two elements or functions, consciousness and inference. Consciousness is awareness of self and change in self, and inference is a guess at the cause of the change. We can discover these functions or elements in all of the judgments of mind. I am conscious of a sound; I infer that it is the voice of a friend. I am conscious of an odor, and infer that it is caused by a rose. I am conscious of a flavor, and I infer that it is the taste of an apple. I am conscious of a sense impression of color, and I infer that it is caused by a tree. These judgments may be erroneous and I may believe in illusions, but in every case a judgment is formed, whether correct or incorrect. The condition under which judgments produce illusions or certitudes will hereafter be set forth. That which we have to consider now is that in every mentation, whether true or false, as in the perceptions mentioned, there is a consciousness and an inference. It will be noticed that we have defined the term consciousness as awareness of change in self, and to this definition we shall adhere. The word is used in many other senses, but in science it becomes necessary to use words with a single meaning. For example, we might use the term consciousness to mean also the cognition of self or another, and it is often used in this manner as a general synonym for cognition, but we must have some term to designate awareness of the change in self and select the word consciousness for that purpose, as that seems to be its fundamental meaning.

A consciousness is awareness of change in self, so inference is the interpretation of the meaning of that change. A change has been effected upon my organ of hearing, and I am conscious of a sound and interpret it as a voice; this interpretation is inference. It is not a random guess, but a guess dictated by experience or some collateral circumstance which suggests this guess. Consciousness, therefore, is not only independent, but it is also absolute in the sense that it must have reality as a change in self; the inference is not only dependent, but it is also subject to error. It may be a certitude or it may be an illusion. Thus, there is either a certitude or an illusion produced by an inference. How then does the mind distinguish between certitudes and illusions? Here we have to consider cognition.

Verification is the proof of the inference by experience. Cognition is composed of three functions: consciousness, inference, and verification. That which is produced by cognition is certitude. A judgment is composed of two functions—consciousness and inference; if verification is added by experience it becomes a certitude; if it is not verified by experience it is proved to be an illusion. These may seem very simple propositions and self evident, as they are, yet they are fundamental and must be clearly understood in order that proper progress may be made in the study of cognition.

What I have designated as consciousness and so defined the term Rehmke designates as subject of consciousness; what I have defined as inference he calls attribute of consciousness. But I go on to use judgment in a restricted sense as based on a consciousness and an inference, and then use cognition as a mentation of three elements—consciousness, inference and verification. As I understand Rehmke's method of defining the two terms of consciousness, he makes a valid distinction which is fundamental in psychology and if properly and rigidly observed dispells many illusions in psychology, and experimental psychology has abundantly demonstrated Rehmke's position.

I regret that I have not seen Rehmke's book, and on consulting the four papers of SCIENCE for last September I do not discover that it was reviewed therein as indicated by his remarks.

In the judgments formed in the experiment with the two weights the blindfolded man makes a judgment of relative weights; the seeing man makes a judgment of relative specific weights. Having in advance seen the weights, he has already formed a judgment and uses this judgment of sight in interpreting the consciousness experienced through the sense of muscular strain. The psychology of sensation and perception cannot be understood or explained without using distinct, definite and understood terms for what I have called consciousness, inference, judgment, verification and cognition. What terms shall be used matters little; it may be that Prof. Rehmke's use of subject of consciousness and attribute of consciousness is wise, but I fear that it will make still greater confusion in a subject which is already burdened with terms, and it seems to me better to follow the example of the physicists in giving restricted meanings to words already in use, as in the case of momentum, energy, force and

power, and then rely upon the acceptance of the terms with the restricted meanings.

J. W. POWELL.

WASHINGTON, D. C., May 16, 1896.

SCIENTIFIC LITERATURE.

Text-book of Comparative Anatomy. By ARNOLD LANG. Translated by H. M. and M. BERNARD. Part II. London and New York, Macmillan & Co. 1896. 8°. Pp. xvi+618, with many illustrations.

The second part of this well-known text-book has been impatiently awaited by teachers of invertebrate anatomy and those who desired a convenient work of reference summarizing the essential facts of the science. Among the numerous text-books of this sort which have appeared of late years, each of which has had its especial merits, that of Lang has reached an easy preëminence, on account of the wide erudition and judicial temper with which the different topics are treated. It is, of necessity, in one sense, a compilation and the chief criticism which has been made upon the German edition is that the authorities for the facts used are cited in mass as literature and not in connection with the particular data due to each. Prof. Lang explains that considerations of space made this obligatory, though, naturally, the work, as a book of reference, would have gained in value as well as size by specific citations. The translation, on the whole, is easy and idiomatic, only occasional Teutonicisms are noted, though it would seem as if some more apposite term than 'Appendage' might have been used for the supplementary chapters on *Rhodope* and *Rhabdopleura*. The typography of the English edition is much more tasteful than that of the original; the illustrations are well printed, and the work will doubtless receive a wide and merited acceptance as a text-book. The present volume includes *Mollusca*, *Echinodermata* and *Enteropneusta*, but the special criticism on this occasion will be confined to the mollusks.

It would be superfluous, perhaps, to criticise in this place the general plan upon which such text-books are constructed, but it cannot be denied that the comparison, organ by organ of a multitude of animals, leaves a somewhat incoherent impression upon the mind. As things are constituted, anatomists are rarely systematists and the systematic part of any of the manuals leaves much to be desired by the specialist. The ideal comparative anatomy would relegate the specific facts to eminent specialists and the comparisons to a systematic genius as editor, a state of beatitude which we are far from approaching.

Prof. Lang is not an eminent specialist in mollusks, but he has a wide knowledge of the literature, and his remarks on mooted points are generally characterized by good sense and sound judgment. The compendium may be said to be, as a whole, representative of the date of 1889, though, in some instances, the text shows later references.

In selecting an architypal mollusk with which to compare his actual animals, the author has followed Lankester's hypothesis of 1884. The architype is regarded as an animal somewhat between *Fissurella* and *Chiton*, bilaterally symmetrical with a posterior vent and straight alimentary canal. We are of opinion that Prof. Verrill's suggestion that the architypal mollusk in the main conformed to the type of the molluscan veliger, with a bent intestine and anterior vent, is much more in harmony with our knowledge of the facts; but space forbids a discussion of the question here. The classification of the Pelecypods is adopted from Pelseneer, whose method has been of late pretty thoroughly tested and found wanting, though at the time this text-book was in the making, it was the newest and presumably the most satisfactory. On the whole, however, Prof. Lang has succeeded in bringing together the data in an excellent manner, and the cordial reception of the German edition is sufficient evidence of the estimation in which his work is held by his scientific colleagues.

Since this work will undoubtedly take a prominent place among the text-books used by teachers, it will not be regarded as hypercriticism to use the remainder of our space in pointing out such items as, on a general perusal, have appeared contestable, erroneous or obsolete. Any work of this kind necessarily contains a certain percentage of such slips, and their presence cannot justly be regarded as condemning it above its fellows. Their correction, therefore,

is not to be taken as diminishing the high opinion of the merits of Prof. Lang's work which we have already expressed.

The bloodvascular system of mollusks (p. 1) is not 'open' in the ordinary sense of that word, but closed, though partly lacunary.

In the true Diotocardia an intromittent male organ is absent chiefly in the littoral species, having been shown to exist in many deep water forms such as *Cocculina*, *Addisonia*, *Fissurella*, *Solariella*, many *Puncturellidæ*, etc., and it should not, therefore (p. 4), be predicated of the entire group. The arrangement of the *Tænioglossa* is imperfect (p. 6); the *Capulidæ* have a retractile proboscis and are therefore not 'Rostrifera.' The *Columbellidæ* are not *Tænioglossa*. *Janthina* can hardly be called siphoniferous.

The nudibranchiata are not all destitute of a mantlefold (p. 10), at least if that fold be defined with any consistency, *e. g.*, *Pleurophyllidia*.

The gymnosomatous pteropods (p. 11) do not feed chiefly on *Thecosomata*, but on hydrozoa. The absence of a mantle is merely nominal, that organ being coincident with the integument, in any practical view. The arrangement of the Decacerate cephalopods is antiquated (p. 24); *Spirula* is undoubtedly Oigopsid.

Throughout the work (cf. p. 26) conchioline is more or less confused with chitine. The periostracum of bivalves is referred to as chitinous, by the majority of writers, as well as Lang, but long ago Loew showed that the chitine of mollusks (jaws and radula) does not give a saccharine reaction with sulphuric acid, and is not therefore identical with ordinary chitine, while the conchioline of the periostracum and test is purely horny, dissolving with ease in liquor potassæ and in no respect chitinous.

The spines of *Amphineura* are homologized with the shell of *Chiton* (p. 29) and later the tegmentum of the chiton and its 'aesthetes' are correctly homologized with the corium of the girdle and its spines; it seems surprising, therefore, especially when the embryology of *Dondersia* and *Chiton* is considered, to find (p. 40) an attempt at homologizing these cuticular structures not only with the true shell (articulamentum) of *Chiton*, but even with the shell of mollusks in general. The shell of *Argonauta* (p. 38) is a product of secretion from the cuticle, serving the purpose of an oöphore, and should not be homologized with the protoconch and concha of other cephalopods. The figure of *Chitonellus* (more properly *Cryptoplax*) is taken from a very contracted spirit specimen and fails to show the proper proportions of the foot. Speaking of the concrescence of the mantle margin in Pelecypoda (p. 51), it should be stated that several superanal foramina occur in Naiades occasionally, and the fourth ventral orifice in *Pholadomya*, etc., is with little doubt correlated with the opisthopodium and not with the byssus. We find no reference to the opisthopodium in the book. The extensive concrescence of the mantle edges (p. 52) is not 'always' accompanied by 'well developed siphons,' *e. g.*, *Tridacna*, *Chama;* and the same examples show that the statement that in sessile forms the mantle is found completely open is far from being generally true.

In discriminating the ligament and resilium the latter is said (p. 61) to be elastic and the former not so; in fact, both are elastic and the resilium adds resiliency to its tensional elasticity. Paleontology shows the error of the statement (p. 63) that the Pectinidæ are probably derived from sessile forms. The gape in many bivalves is accounted for (p. 64) by 'the greater development of siphons and foot' which is merely an incident of the gaping; the true reason is to be sought in the less need of shelly protection among deep burrowers; Pholads (p. 65) are said to rasp the stone by the edges of the valves. While this is true of certain forms like *Teredo*, in many others, including most Pholads, the rasping is done by the surface of the foot. The snout in *Capulus* (p. 102) is erroneously stated to be not invaginable. It is really invaginable from the base, much as in *Dolium*. The filamentous 'tentacles' (= captacula) of Scaphopods are not homologous with the tentacles of Gastropoda. In treating of the epipodium, mention might have been made of its modification to serve as a seminal conduit in certain Trochids. The *Unionidæ* (p. 115) are not, as a rule, mud dwellers. The musculation of *Chiton* (p. 120) has recently been fully described by Lillian Sampson. The statement that the muscles of mollusks are never striated (p. 119) is not true literally (p. 124), but the

differences between their striation and that of vertebrates should have been explained. Burne has recently shown that a supraœsophageal commissure exists in *Hanleyia abyssorum* and probably in other chitons, as well as one (p. 129) below the œsophagus. *Cassidaria* (p. 163) does not belong to the *Toxiglossa*. The jaw, frequently, and the radular teeth always are not, as stated (p. 177), composed of conchioline, but of a special sort of chitine. The basal membrane of the radula (p. 181) is not 'rough' and not formed of conchioline. The transverse rows of the teeth (p. 182) properly counted invariably resemble one another; an alternation of discrepant rows is unknown, except as a blunder in defining the row. The accepted name of the central teeth is rhachidian, and not rhachial. In certain *Toxiglossa* the basal membrane of the radula is represented by two separated very narrow strips. The sucker-like organ on the proboscis of *Natica* is probably an organ of prehension; there is no evidence that it has anything to do with the boring by which the animal penetrates bivalve shells. In the naiades (p. 262) the young are not always developed in the outer gill, but also in the inner or in both, in some cases. The marine *Philobrya* also has a glochidium, while the whole family of *Mutelidæ* are without this commensal stage.

The above inaccuracies are due largely to the habit of anatomists of generalizing too widely on a too slender basis of observation. This might once have been excusable, but fortunately is rapidly becoming no longer so.

W. H. DALL.

Die Bronzezeit in Oberbayern. By VON DR. JULIUS NAUE. 4°, pp. 292. With album of fifty plates. Piloty & Löhle, Munich.

Southwest of Munich, amid the lovely scenery which surrounds the Ammer and Staffel Lakes, a number of sepulchral tumuli were discovered some years ago, which on investigation dated back to the age of bronze, ranging in time from its earlier to its later periods. Fortunately for prehistoric science, they attracted the attention of Dr. Julius Naue, of Munich, and he set about their thorough and accurate examination. For fifteen years he has personally explored them, spade in hand, surrounding his digging with those numerous precautions which the field archæologist should always respect.

Before his researches, practically nothing was known of the conditions of the peoples of the bronze age in the region indicated. By the opening of more than three hundred burial mounds and the sedulous study of their contents, he is able in the handsome volume named above to offer an almost complete restoration of the culture of that remote epoch.

In the older graves there are abundant utensils, weapons and ornaments of bronze; bowls, jars and plates in earthenware, frequently in artistic forms and decorated externally in lines and spirals; and a quantity of amber. No other metal was exhumed. Only in the later graves very small objects in gold and pearls of glass appear, but iron and silver continue unknown.

The text presents first the notes of each excavation. Then follow detailed descriptions of the weapons exhumed, the tools and utensils, articles of ornament and pottery. Special studies are appended on the material and technique of the objects, their form, style and ornamentation, and the inferences which they enable the student to draw regarding the people who left these memorials of their presence. The conclusions on the last topic are unexpected. We find ourselves in the presence of an industrious and peaceable community, depending on agriculture almost exclusively, cultivating the soil diligently and raising herds of cattle. They wore woolen clothing, with ornamented leather belts and decorated with bronze plates. They were of good stature, the men 1.65–70, the women 1.60–65. They were firm believers in a life after death, and surrounded the corpse with such objects as it was supposed to require in its wanderings in spirit land. Women took a high rank in the community as queens and priestesses. Some of the most elaborate of the interments preserved their remains only.

The culture was a progressive one. It can be traced from the neolithic time through the whole of the bronze age down to the epoch when the Roman forays destroyed it. Slowly but steadily it had increased, and for centuries

a state of comparative peace must have prevailed to permit this uninterrupted growth.

The numerous illustrations in the text and the admirable album of fifty-full page plates present in the most satisfactory manner the results of these important and suggestive excavations.

D. G. Brinton.

Current Superstitions Collected From the Oral Tradition of English-Speaking Folk. Edited by Fanny D. Bergen, with Notes and an Introduction by William Wells Newell. Pp. 161. Price, $3.50. Boston, Houghton, Mifflin & Co.

The strange persistency of ancient superstitions in conditions of modern civilization is well illustrated in this volume. Its peculiar value consists in its presentation of beliefs and practices widely prevalent in our own day and country, most of them having been obtained by private correspondence with persons in various parts of the United States.

They are arranged under nineteen headings, such as love, marriage, dreams, luck, money, weather, warts, moon, sun, death omens, and 'projects.' The last mentioned is the term applied among girls in the United States to the ceremonies of divination by which they learn about the man they are to marry. The editor, Mr. Newell, says he cannot offer any explanation of this signification attached to the word. Is it not a direct descendant of the Latin *projicere sortes*, divination by casting on the ground the divining sticks? This seems borne out by the fact that the most widely extended of these 'projects' is to throw a whole apple paring on the floor, where it forms your true love's initial letter.

The introduction and notes, prepared by Mr. Newell with his customary thoroughness and precision, add much to the value of Mrs. Bergen's collection by bringing out the analogies of the customs mentioned with the folk-lore and mythologies of other times and nations.

Among other noteworthy facts thus elicited is the vitality and number of formulas and beliefs still current in reference to the moon. So extended are these that Mr. Newell says they must be regarded as 'Nothing else than a continued worship of the orb, still connected with material blessings expected from its bounty.' The sun is decidedly less important in popular belief.

Folk medicine is represented by the wearing of amulets and charms, the magical cure of warts, hiccough, toothache, nose bleed and other common ailments. Attention is called by the editor to the fact that in some of these the ancient 'doctrine of signatures' still survives.

Of the incidents of life, the two around which is associated the largest body of living superstition are marriage and death. Mr. Newell explains the latter by the suggestion that "The disinclination to exercise independent thought on a subject so serious leaves the field open for the continuance of ancestral notions," which seems an appropriate solution. He adds some pointed observations on the value of folk-lore to history, comparative mythology and archæology.

The volume is a member of the series issued under the auspicies of the American Folk-lore Society. It is to be regretted that it is not furnished with an index, an omission scarcely excusable in a work of the kind.

D. G. Brinton.

SOCIETIES AND ACADEMIES.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, MAY 19, 1896.

The collections made by Dr. A. Donaldson Smith in Western Somali Land and the Galla Country, northeastern Africa, in 1894, were presented to the Academy, their value and extent being commented on by Mr. Arthur Erwin Brown on behalf of the curators.

Dr. Donaldson Smith spoke of the physical features of the regions from which the specimens had been collected and gave briefly some facts regarding the habits of the animals observed by him. Somali Land is very arid and barren, yet a greater variety of specimens and more new forms had been secured there and from the 200 miles beyond than from all the rest of the 4,000 miles traversed by him. In illustration it was stated that twenty-three new species of birds had been obtained from the district specially referred to, while but one had been secured elsewhere. Scattered over the

barren plains were little pyramids from which the sand was thrown up in jets by a hairless mole, which was only observed 200 miles from the coast. The hairlessness of this animal, *Heterocephalus glaber* Rüpp, is a unique feature among the rodentia. The specimen presented by Dr. Smith to the Academy is the only alcoholic preparation of the species known to exist and the second one on record in any form, the type being in the Senckenburg Museum.

Another specimen of unusual interest and variety is one of *Trilophomys imhausi* Milne Edw.—a maned rat covered with long, stiff hair, arranged in three longitudinal divisions. Its nearest affinities in externals and habits are to our marmots.

A *Colobus* or horse-tailed monkey occurred in troups of 500 or 600 and formed a very peculiar feature of the landscape. The skins are used by the natives to form bands for the ankles and knees. The species is the *guereza* of Rüppell. Guinea fowls were found plentifully wherever there was water, a beautiful vulturine form being of special interest. An infinite number of bee eaters were observed, especially about Lake Rudolf, where they were active in catching the insects driven up by the volcanic smoke.

The entire collection of mammals, which was commented on in detail by Mr. Samuel N. Rhoads, includes fifty genera and about seventy species represented by 200 specimens. Seven genera and twelve species are new to American museums. This portion of Dr. Smith's gift is of special interest and value, as the mammals alone have not been examined and described by specialists elsewhere. Mr. Rhoads also spoke of the fishes and reptiles. The batrachia embrace 40 species of 18 genera, mostly new to the Academy.

Mr. Witmer Stone spoke of the collection of birds which had been determined by Mr. Bowdler Sharp, of the British Museum. The portion presented to the Academy consists of 150 specimens of about 100 species, fully one-half new to the museum. A new species of *Turacus* was found in the darkest portion of the inland forest and had been named in recognition of the discoverer's distinguished services to science.

Dr. Henry Skinner stated that the insects included 871 specimens; the distribution in the several groups was noted. A report on the diptera was made by Mr. Chas. W. Johnson, and Mr. Wm. J. Fox spoke of the collection of hymenoptera consisting of 160 specimens, all of which were new to the Academy's cabinet, eight being of undescribed species.

There were but few mollusks, but on those which were presented, Mr. Henry A. Pilsbry based some remarks on the molluscan fauna of Africa and its geographical distribution.

The entire collection is probably the most extensive and important yet brought from Africa by an individual explorer, and the portions so generously given to the Academy by Dr. Smith form a valuable addition to its resources.

Mr. Henry A. Pilsbry spoke of the geology of the deposit containing fossil *Unionidæ* at Fish House, New Jersey. The mussels, some twelve species of *Unio* and *Anodonta*, occur in a thick black clay stratum used for brick and tile making. Below this is a stratum of red clay, gravel and 'ironstone' (bog iron), about two feet thick, which rests on a bed of sand of unknown depth. This sand shows the stratification and oblique lamination characteristic of arenaceous deposits in running water. The speaker considered that the hypothesis of an ancient 'ox-bow' of the Delaware river explained the phenomena presented, the underlying sand having been deposited in the bed of the river; the channel was then abandoned for a new one, leaving a lagoon or 'slough,' in which the layer of yellow material was deposited at subsequent times of freshet, and after the up-stream end of the lagoon was entirely filled up, the black clay was formed in idle water, largely by the decay of organic matter, molluscan and other life flourshing in lagoons of this nature. Mr. Pilsbry held that the black clay and underlying sand was a deposit wholly different in genesis and earlier in time than the gravel which overlies the clay bed, this last gravel being referred by Prof. Salisbury to the Pensauken formation. Besides the mussels, fossil wood occurs in the black clay, as well as remains of the pleistocene horse, *Equus major* Leidy, determined by Prof. Cope.

The latter, as well as the Unionidæ (some of which are recent species), prove the deposit to be of post-pliocene age, instead of cretaceous, as claimed by Dr. Lea, Prof. Whitfield and some others. The character and age of these deposits were further considered by Messrs. Woolman and Heilprin.

A paper entitled 'The Planktonokrit, a centrifugal apparatus for the volumetric estimation of the food supply of oysters and other aquatic animals,' by Chas. S. Dolley, M. D., was presented for publication.

EDWARD J. NOLAN,
Recording Secretary.

PROCEEDINGS OF THE TORREY BOTANICAL CLUB, MAY 12, 1896.

AT the regular meeting, owing to the absence of the President and both Vice-Presidents, Dr. N. L. Britton and afterwards Mr. L. G. Fay occupied the chair. Dr. A. Schneider acted as Secretary.

One nomination for membership was received and the following communication was read and recommended to be placed on the minutes:

Secretary Torrey Botanical Club:

DEAR SIR: I have the honor to inform you that Mr. Edward Berry has presented the Torrey Club with fifty fine specimens of plants from the country about Passaic, N. J., and other counties of the same State. They will be mounted and placed among the other specimens in the herbarium as soon as opportunity offers. I remain, sir.

Very respectfully yours,
HELEN INGERSOLL,
Curator.

Mr. A. A. Tyler read his paper on 'A historical Review of the Study of Stipules.' He presented briefly the older opinions in regard to the morphology and modification of stipules. The paper was discussed by Dr. Britton and others. Mr. Tyler subsequently made further remarks on the origin and development of stipules.

The paper entitled 'Appendages to the Petioles of Liriodendra' by Mr. Arthur Hollick was read by title, owing to the absence of the author.

Meeting adjourned.

W. A. BASTEDO,
Secretary pro tem.

ALABAMA INDUSTRIAL AND SCIENTIFIC SOCIETY.

THE sixth annual meeting of the Alabama Industrial and Scientific Society was held in Birmingham, Ala., on May 13th; eighteen members present. On account of the death of the President, Mr. Thos. Seddon, the Vice-President, Mr. F. M. Jackson, presided. Papers were read before the Society, as follows:

'On the Manufacture of Steel in the Birmingham District,' by Paschal G. Shook; 'On the Grading of Coke Iron, with special reference to the Birmingham District,' by W. H. Brannon; 'On the Grading of Coke Iron,' by Dr. Wm. B. Phillips; 'On Gold Mining in Alabama,' by Wm. M. Brewer; 'On the Coal Washer used at Brookwood, Ala.,' by F. M. Jackson. A paper by Jno. S. Kennedy, of Chambersburg, Pa., on 'Blast Furnace Flue Dust,' was read by title in the absence of the author.

Steps were taken to provide for the collection and publication, monthly, by the Society, of the statistics of coal and iron production in Alabama. Twelve new members and the officers for the current year were elected. These officers are: President, F. M. Jackson; Vice-Presidents, Jas. H. Fitts and Jos. Squire. The Society then adjourned to meet again in November.

EUGENE A. SMITH,
Secretary.

NEW BOOKS.

Publications of the Washburn Observatory of the University of Wisconsin. Vol. IX. Part I. Investigation of the Aberration and Atmospheric Refraction. By GEORGE C. COMSTOCK. Part II. Determinations of Right Ascension. By ALBERT S. FLINT. Madison, Wis. 1896.

Artistic and Scientific Taxidermy and Modelling. MONTAGU BROWNE. London, Adam and Charles Black; New York, Macmillan & Co. 1896. Pp. xx+467. $6.50.

Ice Work, Present and Past. T. G. BONNEY. New York, D. Appleton & Co. 1896. Pp. xiv+205. $1.50.

Erratum: In the article by Prof. O. C. Marsh on *The Ape-man from the Tertiary of Java*, page 792 above, four lines were misplaced by the printers in inserting the illustrations. The last line of the first column and the first three lines of the second column should follow the fourth line of the first column.